What is claimed is:

1.   An optical system having at least one deformable mirror so that focusing can be performed by only deformation of the deformable mirror.

2.   An optical system according to claim 1, wherein the deformable mirror is changed into a rotationally asymmetrical shape in a preset state in order to reduce decentering aberration.

3.   An optical system according to claim 1 or 2, wherein at least one rotationally symmetrical lens or an imaging plane is decentered with respect to a Z axis in order to correct decentering aberration.

4.   An optical apparatus using an optical system, the optical system having at least one deformable mirror so that focusing can be performed by only deformation of the deformable mirror.

5.   An optical system and an optical apparatus using the optical system having at least one deformable mirror so that focusing can be performed by only deformation of the deformable mirror, the deformable mirror being constructed so that as an object distance for focusing is reduced, positive power is increased.

6.   An optical system according to claim 1, wherein the deformable mirror is constructed so that one of positive power and negative power can be assumed by the deformation.

7.   An optical system according to claim 1, wherein the deformable mirror is constructed so that only positive power can be assumed.

47

8.   An optical system according to claim 1, wherein the deformable mirror is constructed so that when a mirror surface is deformed, a periphery of the mirror is fixed.

9.   An optical system according to claim 1, further having at least one cemented lens.

10.   An optical system including a deformable mirror, wherein the optical system satisfies the following condition in a preset state:

$$0 < | \, md / fl \, | < 0.1$$

where md is a maximum amount of deformation of the deformable mirror and fl is a

5   focal length of the optical system where the deformable mirror has a planar surface.

11.   An optical system including a deformable mirror, wherein the optical system satisfies the following condition in a preset state:

$$0 < md^2 / Sm < 5.0 \times 10^{-4}$$

where md is a maximum amount of deformation of the deformable mirror and Sm is

5   an area of an optically effective reflecting surface in the deformable mirror.

12.   An optical system including a deformable mirror, wherein the optical system satisfies the following condition in a preset state:

$$0 \leqq | \, Vm \, | < 500$$

where Vm (volt) is a voltage applied to the deformable mirror in focusing.

13.   An optical system including a deformable mirror, wherein the optical system satisfies the following condition in a preset state:

$$0 \leqq | \, \phi DM \times fl \, | < 1.00$$

where ϕDM is a power of the deformable mirror and fl is a focal length of the optical

5   system, in which the power ϕDM of the deformable mirror is an average value of a

power ϕDMy in a plane in a decentering direction (a Y direction) of the deformable mirror and a power ϕDMx in a plane in a direction perpendicular to the Y direction (an X direction), and is defined as $\phi DM = (\phi DMx + \phi DMy) / 2$.

14. An optical system according to claim 13, wherein when focusing is performed at a far point by the deformable mirror, the deformable mirror can be deformed to have lower power than in focusing.

15. An optical system according to claim 13, wherein when focusing is performed at a near point by the deformable mirror, the deformable mirror can be deformed to have higher power than in focusing.

16. An optical system according to claim 1 or 13, wherein when focusing is performed by the deformable mirror at the object point where the object distance is infinite, the deformable mirror is deformed not into a planar surface, but into a concave surface having larger power than zero.

17. An optical system including a deformable mirror, wherein the optical system has a lens unit with negative power on an object side of the deformable mirror and satisfies the following condition:

$$-5.0 < f\,1 \,/\, fl < -0.2$$

where f 1 is a focal length of the lens unit and fl is a focal length of the optical system.

18. An optical system according to claim 17, wherein the lens unit with negative power located on the object side of the deformable mirror is constructed with a single concave lens.

49

19.	An optical system according to claim 17, wherein the lens unit with negative power located on the object side of the deformable mirror is constructed with two lenses.

20.	An optical system according to claim 1, wherein the optical system satisfies the following condition:

$$60° < \theta < 120°$$

where an angle where an axial chief ray is bent by the deformable mirror.

21.	An optical system including a deformable mirror, wherein the optical system satisfies the following condition:

$$0.35 < |\beta 1| < 1.50$$

where $\beta 1$ is a magnification of a lens unit ranging from an optical surface situated immediately behind the deformable mirror to a last surface.

22.	An optical system including a deformable mirror, wherein the optical system satisfies the following condition:

$$1.0 < Cj / fl < 20.0$$

where Cj is an overall length of the optical system and fl is a focal length of the optical system.

23.	An optical system including a deformable mirror, wherein at least one lens is shifted in order to correct decentering aberration produced by the deformable mirror and the optical system satisfies the following condition in a preset state:

$$0.0 \leq |\delta / fl| < 1.00$$

where δ is an amount of shift of the lens and fl is a focal length of the optical system.

24.	An optical system according to claim 23, wherein a lens unit with negative

power placed on an object side of the deformable mirror is constructed with two lenses and the optical system satisfies the following condition:

$$\delta_1 \times \delta_2 \leqq 0$$

where δ_1 and δ_2 are shifts applied to the two lenses.

25. An optical system including a deformable mirror, wherein at least one lens or an imaging plane is tilted in order to correct decentering aberration produced by the deformable mirror, and the optical system satisfies the following condition in a preset state:

$$0.0° \leqq |\varepsilon| < 10.0°$$

where ε is the amount of tilt applied to the lens or the imaging plane.

26. An optical system according to claim 25, wherein, of absolute values of amounts of tilt applied to individual lenses or the imaging plane, the absolute value of the amount of tilt of the imaging plane is largest.

27. An optical system according to claim 25, wherein that a direction of tilt applied to the imaging plane is a direction approaching parallel to the deformable mirror.

28. An optical system including a deformable mirror and applying a shift and tilt to at least one lens or an imaging plane in order to correct decentering aberration produced by the deformable mirror, wherein the shift takes place in a certain plane and a rotary axis of the tilt is perpendicular to the plane.

29. An optical system according to claim 1, wherein a stop of the optical system is located on an image side of the deformable mirror.

51